Much support and *more*

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Abstract. This paper examines the semantics of *much* when it occurs
as a dummy element, in so-called *much* support (*Fred is diligent; in fact
he is too much so*) and *more* comparatives (*more intelligent*, where *more*
= *much* + *-er*). It is shown that far from being anomalies, *much* support
and *more* comparatives provide a clue to the correct analysis of *much*
more generally: *much* is essentially contentless, serving only as a carrier
of degree morphology. In short, *much* always acts as *much* support. These
findings provide evidence towards a theory of quantity adjectives (*many,
few, much* and *little*) as predicates of scalar intervals, with the remainder
of the content traditionally ascribed to them contributed instead by null
syntactic elements and operations. The vacuous nature of *much* itself
is also argued to account for its infelicity in unmodified form in many
contexts (e.g. ??*We bought much rice.*).

1   Introduction

1.1   The Problem

A curiosity about *much* is its ability to act as a dummy element. *Much* otherwise
has uses as a quantifier meaning 'a large quantity of' (1), and as an adverbial
element meaning 'to a high degree' (2):

(1)   a. Much alcohol was consumed last night
      b. Much office work is tedious
      c. We don't have much rice

(2)   a. I much prefer wine to beer
      b. Isabelle works too much

But consider cases such as (3), an example of what Corver (1997) refers to as
much support. If *so* is a pronominal copy of the adjective *diligent* (or of some
projection of the adjective), which is modified by the degree modifier *too*, *much*
does not appear to make any semantic contribution at all.

(3)   John is diligent; in fact, he is too much so

A similar issue is posed by comparatives formed with *more*. In (4), *more intelligent* and *smarter* seem parallel in interpretation, involving the comparative forms of *intelligent* and *smart*, respectively. This would suggest that the comparative morpheme *-er* and *more* are semantically equivalent. But *more* in its quantificational uses has beeen analyzed as the comparative of *much* (and *many*) (5) (cf. Bresnan 1973). If this approach is extended to cases such as (4a) (i.e. *more intelligent = much + -er + intelligent*), we again have an extra *much* without apparent semantic content.

(4) a. Sue is more intelligent than Fred

     b. Sue is smarter than Fred

(5) I have more [much + -er] rice than I need

1.2 Previous Treatments

Within the literature, there have been two main approaches to the facts outlined above. On the one hand, Bresnan (1973) posits an underlying *much* in adjectival projections generally, such that the adjective phrase in (6a) is underlyingly (6b). In pre-adjectival contexts, *much* is then deleted via a rule of *much*-deletion (7):

(6) a. Mary is too intelligent

     b. [$_{AP}$[$_{QP}$ too much] intelligent]

(7) much $\to \emptyset$ [$_{AP}$...---- A]

In this way, a parallel can be reestablished between cases such as (4a), where *much* is present (in its comparative form *much + -er = more*), and (4b), where *much* has been deleted via (7).

Corver (1997), on the other hand, distinguishes two *much*'s: the lexical contentful *much* of examples such as (2) and the 'dummy' *much* of *much* support (3). The former is an adjectival element that introduces its own degree argument; the latter is a dummy element that is inserted as a last resort to establish a local relationship between a degree operator (e.g. *too* in (3)) and the degree argument of the pro-form *so*. See also Kennedy and McNally (2005) and Rett (2006) for analyses of some instances of *much* as a dummy element.

Questions can be raised about both of these alternatives. As noted by Corver, Bresnan's rule of *much*-deletion gets the facts right, but otherwise does not have much explanatory force. Conversely, as will be discussed further below, there is also little independent support for a dichotomy between two versions of *much*. In fact, I argue that neither of these approaches is necessary.

1.3 Main Claim

The central claim of this paper is that there is nothing anomalous about the *much* of *much* support and *more* comparatives. *Much* in these contexts has precisely the same semantics as it does in the apparently contentful cases (1) and

(2). Specifically, *much* in its lexical semantics is essentially contentless, serving only as a carrier of degree morphology, which can be inserted as needed for morphological or syntactic reasons, without affecting the compositional semantics. To put it differently, *much* in essence is always *much* support.

2   Proposal

2.1   The Decomposition of *much*

The broader context for the present analysis is a theory according to which the adjectives of quantity (Q-adjectives) *many, few, much* and *little* are taken to denote predicates of scalar intervals, an approach that builds on Schwarzschild (2006) and Heim (2000, 2006). This is independently motivated by the need to account for their differential uses, as in (8) and (9).

(8)   a. We have <u>much</u> more than 10 kg of rice
      b. We have <u>little</u> more than 10 kg of rice
      c. We have <u>much</u> less than 10 kg of rice

(9)   a. John is <u>much</u> shorter than Fred
      b. John is <u>much</u> younger than Fred

Q-adjectives are most commonly analyzed as quantifying determiners (e.g. Barwise and Cooper 1981, Higginbotham 1995), as in (10a). Alternately, building on analyses of cardinal numbers as cardinality predicates (e.g. Landman 2004), one might treat Q-adjectives as predicates over groups or portions of matter (10b) (along these lines, see Partee 1989 for a predicative treatment of *many* and *few*).

(10)   a. $[\![\text{much}_{quant}]\!] = \lambda P \lambda Q.\exists x[P(x) \wedge Q(x) \wedge \mu_{DIM}(x) > d_{Std}]$
       b. $[\![\text{much}_{pred}]\!] = \lambda x.\mu_{DIM}(x) > d_{Std}$
           where $\mu_{DIM}(x)$ is a measure function that associates a portion of matter with a degree on some dimension *DIM* (e.g. weight, volume, etc.) and d_{Std} is a context-dependent standard of comparison

However, neither of the entries in (10) can be applied to the differential examples in (8) and (9). Here *much* and *little* first of all cannot be analyzed as quantifying determiners (per (10a)), in that there are not two predicates that could serve as arguments. But they also cannot be analyzed as predicates of portions of matter (per 10b)). In (8a), we might be tempted to say that *much* is predicated of that portion of the rice we have in excess of the first 10 kg; but in (8c), there is no equivalent portion of rice of which *much* could be predicated. This same issue applies even more clearly in the case of (9), where there is no stuff of any sort that could serve as an argument for the Q-adjective.

Instead, from an intuitive perspective, *much* and *little* in these cases describe the gap between two values or degrees on a scale (cf. Klein 1982). That is, (8c) specifies that the gap between the amount of rice we have and 10 kg is large;

(9b) specifies that the gap between John's height and Fred's is large. This can be formalized as follows: First, the gap between two scalar values is represented as a scalar interval, that is, a convex set of degrees (11). *Much* and *little* are then taken to denote predicates of scalar intervals (12) (cf. Heim 2006); *much* is true of an interval if its length exceeds some context-dependent standard, while *little* is true of an interval if its length falls short of some (possibly different) standard.

(11) A set of degrees $I_{\langle dt \rangle}$ is an interval iff
$\forall d, d', d''$ such that $d > d' > d''$, $(d \in I \wedge d'' \in I) \rightarrow d' \in I$

(12) a. $\llbracket \text{much} \rrbracket = \lambda I_{\langle dt \rangle}.length(I) > d_{Std}$
b. $\llbracket \text{little} \rrbracket = \lambda I_{\langle dt \rangle}.length(I) < d_{Std}$
where $length(I) = max(I) - min(I)$

The entries in (12) provide what is needed to analyze the differential examples in (8) and (9). For example:

(13) $\llbracket (8c) \rrbracket = 1$ iff $\llbracket \text{much} \rrbracket(\lambda d.amount\ of\ rice\ we\ have \leq d \leq 10kg)$
iff $length(\{d : amount\ of\ rice\ we\ have \leq d \leq 10kg\}) > d_{Std}$

Thus to accommodate the differential uses of *much* and other Q-adjectives, some of the semantic content typically ascribed to these terms (as in (10)) must be stripped away. Specifically,*much* and *little* as defined in (12) are not inherently quantificational; and second, *much* and *little* also do not in their lexical semantics include a measure function, that is, a function that associates portions of matter with degrees (cf. (10)). This would seemingly leave the entries in (12) unable to handle quantificational examples such as (1). But these too can be accomodated with the interval-based semantics given above, by attributing the missing semantic content to other elements. To this end, I first propose that quantificational force arises via existential closure. Second, I follow Schwarzschild (2006) (and less directly, Kayne 2005) in proposing that the measure-function role is played by a functional head Meas in whose specifier position the quantifier phrase headed by quantificational *much* or *little* occurs. Meas has the semantics in (14):

(14) $\llbracket \text{Meas} \rrbracket = \lambda x \lambda d.\mu_{DIM}(x) = d$

To work out a relevant example, (1a) has the surface structure in (15a). But *much* cannot be interpreted in situ due to a type mismatch, so raises at LF (15b), leaving a trace of type d in its base position. The semantic derivation proceeds as in (16).

(15) a. SS: $[[_{DP}[_{MeasP}[_{QP}$ much$]$ Meas $[_{NP}$ alcohol$]]]$ was consumed$]$
b. LF: $[[_{QP}$ much$]_1[_{DP}[_{MeasP}$ t$_1$ Meas $[_{NP}$ alcohol$]]]$ was consumed$]]$

(16) $\llbracket$ much$_1 \rrbracket(\llbracket$t$_1$ Meas alcohol was consumed$\rrbracket)$
$=\llbracket$ much$_1 \rrbracket(\lambda d_1.\exists x[alcohol(x) \wedge consumed(x) \wedge \mu_{DIM}(x) = d_1])$
$= length(\{d : \exists x[alcohol(x) \wedge consumed(x) \wedge \mu_{DIM}(x) = d]\}) > d_{Std}$

The end result in (16) specifies that length of the interval from 0 to the degree corresponding to amount of alcohol consumed exceeds d_{Std} (or in simpler terms, that the amount of alcohol consumed exceeds d_{Std}).

Note also that while the examples discussed here pertain to *much* and *little*, the same approach can be extended to their count counterparts *many* and *few*, by taking the degrees in question to be degrees of cardinality.

However, the analysis outlined here is not, in the present form, quite adequate. *Much* and *little* are gradable expressions, able to combine with degree modifiers (*too much, so much, as much as*, etc.). In their modified forms, they do not have the 'greater than standard' interpretation that characterizes the positive (i.e. unmodified) form (for example, 'I have as much rice as Fred' does not entail 'I have much rice'). This is not captured by the entries in (12), in which the standard of comparison d_{Std} is part of the lexical semantics of *much* and *little*.

Within the literature on gradable adjectives (e.g. Cresswell 1977, Heim 2000, Kennedy 2007), which is extended to Q-adjectives in particular by Hackl (2000), the usual approach to this issue is to remove the standard of comparison from the semantics of the positive form itself. Instead, the gradable expression is given a degree argument as its first argument, which may be be saturated or bound by a degree modifier (e.g. by *too* or *as*). In the case of the bare positive form, where there is no overt degree morphology, a phonologically null degree operator POS (for 'positive') plays this role.

Applied to *much* and *little*, we obtain the following revised forms:

(17)   a. $[\![\text{much}]\!] = \lambda d \lambda I_{\langle dt \rangle}.d \in I$
        b. $[\![\text{little}]\!] = \lambda d \lambda I_{\langle dt \rangle}.\neg d \in I$

A possible definition for the null positive morpheme is the following, taken from von Stechow (2006) and Heim (2006):

(18) $[\![\text{POS}]\!] = \lambda I_{\langle dt \rangle}.N_S \subseteq I$

Here POS introduces as a standard of comparison the range N_S consisting of values that would be considered neither large nor small with respect to the context.[1]

According to the revised semantics in (17), *little* has the semantics of degree negation (a conclusion argued for on independent grounds by Heim 2006), associating an interval with the degrees not contained within it. But *much* simply associates an interval with the degrees within it. The result is that it functions essentially as an identity function on intervals. This becomes evident through an example. With the semantics for *much* and POS introduced above, (1a) has the revised LF in (19), where both *much* and POS have raised from their DP-internal

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[1] Note that with the definition of POS in (18), differential cases such as (8) and (9) must be handled slightly differently than above. This can be accomplished by defining the comparative morpheme *-er* in such a way to produce an interval of the same length as the original gap, but lower bounded by 0. This is worked out in detail in Solt (2009).

surface positions for type-driven reasons. The semantic derivation proceeds as in (20):

(19) LF: $[_{DegP}$ POS$]_2[[_{QP}$ t$_2$ much$]_1[[[_{DP}[_{MeasP}$ t$_1$ Meas $[_{NP}$ alcohol$]]]$ was consumed$]]]$

(20) $[\![$POS$_2]\!]([\![$t$_2$ much$_1]\!]([\![$t$_1$ Meas alcohol was consumed$]\!]))$
$= [\![$POS$_2]\!]([\![$t$_2$ much$_1]\!](\lambda d_1.\exists x[alc(x) \wedge consumed(x) \wedge \mu_{DIM}(x) = d_1]))$
$= [\![$POS$_2]\!](\lambda d_2.\exists x[alcohol(x) \wedge consumed(x) \wedge \mu_{DIM}(x) = d_2])$
$= N_S \subseteq \{d : \exists x[alcohol(x) \wedge consumed(x) \wedge \mu_{DIM}(x) = d]\}$
'The amount of alcohol consumed exceeds N_S'

Here, *much* takes as argument the set of degrees (interval) formed by lambda abstraction over the trace of type d in its base position. Subsequently, lambda abstraction over the trace of POS again produces a set of degrees. But as can be verified above, the second set of degrees is identical to the first. Thus *much* is essentially semantically inert, simply mapping a set of degrees (interval) to itself. It makes no other contribution to the semantics of the sentence.

To summarize, in analyzing *much* as a gradable expression, yet more of its content must be stripped away, and transfered instead to POS, leaving *much* itself as a pure identity element. Put differently, *much* essentially has no content of its own, but serves only as a carrier of degree morphology (in the case above, of POS). It is therefore not surprising that it is able to function as a dummy element.

2.2 Applied to *much* Support and *more* Comparatives

With this framework in place, an analysis of *much* support and *more* comparatives is now straightforward.

I begin with *much* support. With regards to the syntactic structure, I assume that in the case of a degree modifier plus gradable adjective (e.g. *too diligent*), the degree modifier constitutes a Degree Phrase (DegP) located in the specifier position of the adjective phrase AP (Heim 2006).[2] I take *so* to be a pro-form for the adjective, which differs in that it cannot combine directly with a degree modifier (I do not address here why this is the case; presumably the reason is morphosyntactic in nature). To remedy this, *much* is inserted, in the form of a QP headed by *much* in SpecAP. That is:

(21) a. He is $[_{AP}[_{DegP}$ too$]$ diligent$]$
b. He is $[_{AP}[_{QP}[_{DegP}$ too$]$ much$]$ so ~~diligent~~$]$

However, due to the vacuous nature of *much*, the resulting interpretation is semantically equivalent to what would obtain if *much* were not present:

(22) $[\![$too$_2]\!]([\![$t$_2$ much$_1]\!](\lambda d_1.he\ is\ d_1\ diligent))$
$= [\![$too$_2]\!](\lambda d_2.he\ is\ d_2\ diligent)$

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[2] Alternately, the DegP could be analyzed as occuring in the specifier position of some higher functional head in the extended adjectival projection.

More comparatives can be treated similarly. Adjectives that form *more* comparatives (e.g. *intelligent*) cannot compose directly with the comparative morpheme *-er*. I propose that while *-er* comparatives feature a DegP *-er* in SpecAP, *more* comparatives have a QP *more* (i.e., [$_{QP}$ [$_{DegP}$ *-er*] *much*]) in this position.

(23)   a.   Sue is [$_{AP}$[$_{DegP}$ -er] smart]
       b.   Sue is [$_{AP}$[$_{QP}$[$_{DegP}$ -er] much] intelligent]

But again, the interpretation is parallel to that which would obtain without *much*:

(24) $[\![$-er$_2]\!]([\![$t$_2$ much$_1]\!](\lambda d_1.Sue\ is\ d_1\ intelligent))$
       $=[\![$-er$_2]\!](\lambda d_2.Sue\ is\ d_2\ intelligent)$

Thus in both cases, *much* can be inserted to host degree morphology (e.g. *too* or *-er*), without affecting the compositional semantics.

2.3   Summary

In summary, *much* support and *more* comparatives are not anomalies at all, but rather are indicative of the true semantic nature of *much* in general: as a basically content-less dummy element. These data thus provide further evidence for a decompositional analysis of quantity adjectives, according to which these words themselves denote predicates of scalar intervals, with other components of their apparent content instead attributed to null syntactic elements (Meas, POS) and semantic operations (existential closure).

3   The Infelicity of Bare *much*

It has often been noted that bare *much* is only marginally acceptable in many contexts. The (carefully chosen) original example (1a) is itself somewhat awkward; and other examples of unmodified quantificational *much* are typically quite bad (25a). By contrast, in the very same positions, *much* in combination with an overt degree morpheme (*-er*, *too*, *that*, etc.) is perfectly felicitous (25b-g).

(25)   a.   ??I bought <u>much</u> rice
       b.   I bought <u>more</u> rice than I needed
       c.   I bought too <u>much</u> rice
       d.   I bought as <u>much</u> rice as I could
       e.   I bought so <u>much</u> rice that it doesn't fit in the jar
       f.   I didn't realize that I bought that <u>much</u> rice
       g.   How <u>much</u> rice did you buy?

The present analysis suggests an account for this. *Much* is essentially semantically vacuous: Its primary role is as a carrier of degree morphology. As such, it is infelicitous in the absence of an overt degree morpheme. In combination with the

null morpheme POS, whose interpretation is entirely context dependent, *much* does not have enough content to stand on its own. This is particularly the case because *much* does not even specify a dimension of measurement (e.g. *too much rice* could be an excessive amount in terms of weight, volume, etc.).

While I believe this to be fundamentally correct, what is somewhat problematic for this story is that bare *much* is not <u>always</u> infelicitous, a case in point being differential examples such as (8) and (9). In fact, Corver (1997) uses this distinction as support for the existence of two *much*'s, the lexical contentful *much* (acceptable bare) and the dummy *much* (which must occur with degree morphology). But a closer look at the facts suggests that the pattern of felicitous vs. infelicitous bare *much* does not line up in any obvious way with a contentful vs. dummy division.

Specifically, unmodified *much* is typically awkward (if not outright ungrammatical) in quantificational use (26a-c), as a post-verbal modifier (26d) and in *much* support (26e).

(26)　a.　??<u>Much</u> wine is left

　　　b.　??I bought <u>much</u> rice

　　　c.　??Sue lost <u>much</u> money in the stock market crash

　　　d.　??John slept <u>much</u>
　　　　　(cf. John slept too much; John slept as <u>much</u> as he wanted)

　　　e.　??I'm tired; in fact, <u>much</u> so
　　　　　(cf. ...in fact, too <u>much</u> so to go to the party)

But it does not seem plausible to group the quantificational and adverbial uses in (26) with *much* support as examples of dummy *much*.

In all of the above contexts, *much* in its modified forms is entirely acceptable. And interestingly, unmodified *much* is acceptable in the equivalent negative contexts:

(27)　a.　Not <u>much</u> wine is left

　　　b.　I didn't buy <u>much</u> rice

　　　c.　John didn't sleep <u>much</u>

　　　d.　Sue didn't lose <u>much</u> money in the stock market crash

　　　e.　I'm not tired; at least, not <u>much</u> so

Yet lest we conclude that bare *much* is a negative polarity item, there are also non-negative contexts where it is in fact felicitous: the differential use (28a,b), in partitives (28c), as a pre-verbal adverb with a small group of verbs (28d,e), and as a modifier of deverbal adjectives (28f) and two ordinary adjectives, *alike* and *different* (28g).

(28)　a.　We have <u>much</u> more/<u>much</u> less than 10 kg of rice

　　　b.　John is <u>much</u> taller/<u>much</u> shorter than Fred

　　　c.　Sue lost <u>much</u> of her money in the stock market crash

    d. I <u>much</u> prefer wine to beer

    e. I (very) <u>much</u> appreciate your assistance

    f. a <u>much</u> improved effort; a <u>much</u> loved teacher

    g. Mice and moles are <u>much</u> alike/<u>much</u> different

While I do not have a conclusive explanation for these facts, a look at the examples in (26)-(28) suggests that interpretive factors play a role. Here, a comparison of the quantificational (26c) to the partitive (28c) is particularly illuminating. What counts as *much money* is entirely context dependent. But partitives necessarily receive a proportional interpretation; *much of her money* means a large proportion of her money, an interpretation which is much more constrained than that available in the quantificational case. Differential uses of *much* are also constrained in interpretation. While only the context determines what qualifies as *much rice* (26b), in the case of *much more than 10 kg of rice* (28a), the difference must be significant in comparison to 10 kg (i.e. the extra amount required to count as *much more than 10 kg* is different than that needed to count as much *more than a ton*). Other of the examples in (28) can perhaps be assimilated to this: *alike* and *different* (28g) have been analyzed as inherent comparatives (Alrenga 2007), and *prefer* (28d) likewise has a comparative feel. Even the contrast between positive and negative contexts could perhaps be explained in these terms: How much rice is needed to qualify as *much rice* depends on the context (in the formalism developed above, it depends on the scalar location of the standard of comparison N_S); but some amounts will always fall below the standard and count as *not much rice*.

On this view, then, the infelicity of unmodified *much* in some (but not all) contexts could be attributed to semantic underspecification. This seems a promising direction, and one that would benefit from further investigation.

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